

What is claimed is

1           1. A program execution apparatus that determines an  
2     execution sequence of tasks and executes the tasks according  
3     to the execution sequence, each task being given a target  
4     completion time before which execution of the task is to be  
5     completed, the program execution apparatus comprising:

6           a storing unit operable to store at least one identifier  
7     of at least one task that is already in existence, at a memory  
8     position therein determined based upon a plurality of types  
9     of priorities set for the task, the plurality of types of  
10    priorities having a hierarchical relationship;

11          a receiving unit operable to receive an identifier of  
12    a new task and a plurality of types of priorities set for  
13    the new task;

14          a writing unit operable to write the identifier received  
15    by the receiving unit, at a memory position in the storing  
16    unit determined based upon the plurality of types of priorities  
17    received by the receiving unit; and

18          a determining unit operable to determine an execution  
19    sequence of the tasks whose identifiers are stored in the  
20    storing unit, according to an arrangement sequence of the  
21    identifiers in the storing unit.

1           2. The program execution apparatus of Claim 1, wherein

2           a first-type priority and a second-type priority are  
3   set for each task as the plurality of types of priorities,  
4   the first-type priority being a target completion time before  
5   which execution of the task is to be completed, the second-type  
6   priority being lower in a hierarchy than the first-type  
7   priority,

8           the storing unit stores a plurality of groups each  
9   including identifiers of tasks for which a same target  
10   completion time is set as a first-type priority, the plurality  
11   of groups being arranged at memory positions in the storing  
12   unit in an arrangement sequence determined in an order of  
13   a target completion time set for each group, the identifiers  
14   of the tasks in each group being arranged at memory positions  
15   in each group in the storing unit in an arrangement sequence  
16   determined based upon a second-type priority set for each  
17   task in the group,

18           the receiving unit receives the identifier of the new  
19   task, and a target completion time as a first-type priority  
20   and a second-type priority that are set for the new task,

21           the writing unit writes the received identifier, at the  
22   memory position in the storing unit determined based upon  
23   the received second-type priority in a group including  
24   identifiers of tasks for which a first-type priority that  
25   is the same as the received first-type priority is set, and

26           the determining unit determines the execution sequence

27 of the tasks whose identifiers are stored in the storing unit,  
28 according to the arrangement sequence of the identifiers in  
29 the storing unit determined based upon a first-type priority  
30 and a second-type priority set for each task.

1        3. The program execution apparatus of Claim 2, wherein  
2        the storing unit stores, for a beginning group that  
3        includes identifiers of tasks for which a target completion  
4        time closest to a present time is set as a first-type priority  
5        and that is arranged at a beginning of the arrangement sequence  
6        of the plurality of groups, the closest target completion  
7        time as the first-type priority, and stores, for each of groups  
8        that follow the beginning group in the arrangement sequence,  
9        a time period between (a) a target completion time set for  
10       tasks whose identifiers are included in the group and (b)  
11       a target completion time set for tasks whose identifiers are  
12       included in a group that precedes the group in the arrangement  
13       sequence, and

14       the writing unit compares the target completion time  
15       received by the receiving unit with the closest target  
16       completion time, and (i) when finding a match, writes the  
17       received identifier, at the memory position in the storing  
18       unit determined based upon the received second-type priority  
19       in the beginning group, and (ii) when not finding a match,  
20       further compares, for each of the groups that follow the

21 beginning group, (c) the target completion time received by  
22 the receiving unit with (d) a time at which the time period  
23 stored for the group elapses from a target completion time  
24 set for a group that precedes the group in the arrangement  
25 sequence, and when finding a match, writes the received  
26 identifier at the memory position in the storing unit  
27 determined based upon the received second-type priority in  
28 the group.

1 4. The program execution apparatus of Claim 2, wherein  
2 a lowest value of a first-type priority is a maximum  
3 value that can be expressed by a predetermined bit sequence  
4 constituting a target completion time,  
5 the storing unit stores a last group including  
6 identifiers of tasks for which a target completion time  
7 constituted by a predetermined bit sequence expressing the  
8 maximum value is set, at a memory position that is a last  
9 of the arrangement sequence of the plurality of groups,  
10 determined based upon the target completion time,  
11 the receiving unit receives the identifier of the new  
12 task, and the target completion time constituted by the bit  
13 predetermined sequence expressing the maximum value and the  
14 second-type priority that are set for the new task, and  
15 the writing unit writes the received identifier, at the  
16 memory position in the storing unit determined based upon

17 the received second-type priority in the last group.

1           5. The program execution apparatus of Claim 2, wherein  
2           the storing unit further stores, for each group, a total  
3           execution time period that is predicted to take to execute  
4           all tasks whose identifiers are included in the group,  
5           the receiving unit further receives an execution time  
6           period that is predicted to take to execute the new task,  
7           and  
8           the program execution apparatus further includes a  
9           judging unit operable to judge whether a time at which a time  
10          period obtained by adding the total execution time period  
11          and the execution time period received by the receiving unit  
12          elapses from a present time is before the target completion  
13          time set for the new task, and when judging negatively, output  
14          a reject signal indicating to reject execution of the new  
15          task,  
16          wherein when the judging unit judges affirmatively, the  
17          writing unit writes the received identifier, at the memory  
18          position in the storing unit determined based upon the received  
19          second-type priority in a group including identifiers of tasks  
20          for which a first-type priority that is the same as the received  
21          first-type priority is set.

1           6. The program execution apparatus of Claim 5, wherein

2       the judging unit selects one of groups that follow a  
3       group in the arrangement sequence of the plurality of groups,  
4       and judges whether a time at which a total execution time  
5       period for the selected group elapses from a present time  
6       is before a target completion time set for tasks whose  
7       identifiers are included in the selected group, the judging  
8       unit repeating the selection and judgment processes on each  
9       of the following groups, and

10       when the judging unit judges affirmatively for all of  
11       the following groups, the writing unit writes the received  
12       identifier, at the memory position in the storing unit  
13       determined based upon the received second-type priority in  
14       a group including identifiers of tasks for which a first-type  
15       priority that is the same as the received first-type priority  
16       is set, and

17       when the judging unit judges negatively for any of the  
18       following groups, the writing unit outputs a reject signal  
19       indicating to reject execution of the new task.

1       7. The program execution apparatus of Claim 1, wherein  
2       a first-type priority and a second-type priority are  
3       set for each task, the first-type priority being a value  
4       obtained by multiplying predetermined time-units of a target  
5       completion time set for the task by an integer, the second-type  
6       priority being a value of a remaining time-unit of the target

7 completion time that is a smaller unit than the predetermined  
8 time-units,

9 the storing unit stores a plurality of groups each  
10 including identifiers of tasks for which a same first-type  
11 priority is set, the plurality of groups being arranged at  
12 memory positions in the storing unit in an arrangement sequence  
13 determined based upon a first-type priority set for each group,  
14 the identifiers of the tasks in each group being arranged  
15 at memory positions in the storing unit in an arrangement  
16 sequence determined based upon a second-type priority set  
17 for each task in the group,

18 the receiving unit receives the identifier of the new  
19 task, and a first-type priority and a second-type priority  
20 that are set for the new task,

21 the writing unit writes the received identifier, at a  
22 memory position in the storing unit determined based upon  
23 the received second-type priority in a group including  
24 identifiers of tasks for which a first-type priority that  
25 is the same as the received first-type priority is set, and

26 the determining unit determines the execution sequence  
27 of the tasks whose identifiers are stored in the storing unit,  
28 according to the arrangement sequence of the identifiers in  
29 the storing unit determined based upon a first-type priority  
30 and a second-type priority set for each task.

1           8. A task management method for use in a program execution  
2   apparatus that determines an execution sequence of tasks and  
3   executes the tasks according to the execution sequence, each  
4   task being given a target completion time before which  
5   execution of the task is to be completed, the program execution  
6   apparatus including a storing unit operable to store at least  
7   one identifier of at least one task that is already in existence,  
8   at a memory position therein determined based upon a plurality  
9   of types of priorities set for the task, the plurality of  
10   types of priorities having a hierarchical relationship,  
11       the task management method comprising:  
12       a receiving step of receiving an identifier of a new  
13   task and a plurality of types of priorities set for the new  
14   task;  
15       a writing step of writing the identifier received in  
16   the receiving step, at a memory position in the storing unit  
17   determined based upon the plurality of types of priorities  
18   received in the receiving step; and  
19       a determining step of determining an execution sequence  
20   of the tasks whose identifiers are stored in the storing unit,  
21   according to an arrangement sequence of the identifiers in  
22   the storing unit.

1           9. A task management program for use in a program  
2   execution apparatus that determines an execution sequence



3 of tasks and executes the tasks according to the execution  
4 sequence, each task being given a target completion time before  
5 which execution of the task is to be completed, the program  
6 execution apparatus including a storing unit operable to store  
7 at least one identifier of at least one task that is already  
8 in existence, at a memory position therein determined based  
9 upon a plurality of types of priorities set for the task,  
10 the plurality of types of priorities having a hierarchical  
11 relationship,

12 the task management program comprising:

13 a receiving step of receiving an identifier of a new  
14 task and a plurality of types of priorities set for the new  
15 task;

16 a writing step of writing the identifier received in  
17 the receiving step, at a memory position in the storing unit  
18 determined based upon the plurality of types of priorities  
19 received in the receiving step; and

20 a determining step of determining an execution sequence  
21 of the tasks whose identifiers are stored in the storing unit,  
22 according to an arrangement sequence of the identifiers in  
23 the storing unit.

1 10. A task management program recorded on a  
2 computer-readable recording medium for use in a program  
3 execution apparatus that determines an execution sequence

4 of tasks and executes the tasks according to the execution  
5 sequence, each task being given a target completion time before  
6 which execution of the task is to be completed, the program  
7 execution apparatus including a storing unit operable to store  
8 at least one identifier of at least one task that is already  
9 in existence, at a memory position therein determined based  
10 upon a plurality of types of priorities set for the task,  
11 the plurality of types of priorities having a hierarchical  
12 relationship,

13 the task management program comprising:

14 a receiving step of receiving an identifier of a new  
15 task and a plurality of types of priorities set for the new  
16 task;

17 a writing step of writing the identifier received in  
18 the receiving step, at a memory position in the storing unit  
19 determined based upon the plurality of types of priorities  
20 received in the receiving step; and

21 a determining step of determining an execution sequence  
22 of the tasks whose identifiers are stored in the storing unit,  
23 according to an arrangement sequence of the identifiers in  
24 the storing unit.

1 11. A mobile telephone that determines an execution  
2 sequence of tasks and executes the tasks according to the  
3 execution sequence, each task being given a target completion

4 time before which execution of the task is to be completed,  
5 the mobile telephone comprising:

6 a storing unit operable to store at least one identifier  
7 of at least one task that is already in existence, at a memory  
8 position therein determined based upon a plurality of types  
9 of priorities set for the task, the plurality of types of  
10 priorities having a hierarchical relationship;

11 a receiving unit operable to receive an identifier of  
12 a new task and a plurality of types of priorities set for  
13 the new task;

14 a writing unit operable to write the identifier received  
15 by the receiving unit, at a memory position in the storing  
16 unit determined based upon the plurality of types of priorities  
17 received by the receiving unit; and

18 a determining unit operable to determine an execution  
19 sequence of the tasks whose identifiers are stored in the  
20 storing unit, according to an arrangement sequence of the  
21 identifiers in the storing unit.